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CONGRESS AND ARMY OPERATIONAL
TEST AND EVALUATION

BY

MR. FRANK JOHN APICELLA, DAC

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CONGRESS AND ARMY OPERATIONAL TEST AND EVALUATION

AN INDIVIDUAL STUDY PROJECT

by

Mr. Frank John Apicella, DAC

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U.S. Army War College
Carlisle Barracks, Pennsylvania 17013
10 April 1989

ABSTRACT

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Congress has become increasingly more interested in the services materiel acquisition processes. A primary focus of this new concern has been major weapon system operational test and evaluation. This study examines the merits and demerits of congressional initiatives to improve the overall quality of operational test and evaluation, as they relate to the United States Army. The rationale for the establishment, the current effectiveness, and possible future roles of the Defense Operational Test and Evaluation Office (DOT&E) are discussed. The problems and impacts of new Survivability/Vulnerability "live-fire" legislation are explored. Further, the primary and second order effects associated with the strict adherence to the recent congressional mandate which precludes any participation of weapon system contractors or subcontractors in the operational testing and evaluation of their system are also assessed. An overall evaluation of the effectiveness of Army Operational Test and Evaluation and 20 recommendations for improvement are offered for consideration.



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CONGRESS AND OPERATIONAL TEST AND EVALUATION

CHAPTER I

INTRODUCTION

GENERAL

On 9 January 1989 in his first message to Congress our newly selected Commander-in-Chief encouraged them to refrain from micro-managing the armed services procurement processes. At that very time a distinguished ex-member of Congress and the Senate Armed Services Committee was being persecuted by his peers as part of the Secretary of Defense confirmation process for allegedly accepting defense contractor payments of \$750,000 in honoraria and consultant fees. Members of the military services tend to be critical of outside Congressional influence on their day-to-day management activities; especially when these Congressional actions are rationalized by purported wrongdoing, allegations of incompetence, and media theatrics. Finding fault in any large organization is not a difficult task. In the last 30 years Congressional staffs have increased in number by an order of magnitude from 6,400 in 1960 to 17,137

in 1980 to over 19,000 in 1989. These staffs frequently assume fault finding missions in search of new areas where Congressional influence may be applied. Over 55,000 written Congressional inquiries were addressed to the Secretary of the Army in 1988 alone. Military procurement has been a popular hunting ground. Critics of this new, substantial Congressional interest, are concerned about the level of micro-management, fairness, bias, and ethical implications associated with these Congressional "witch hunts". Surprisingly, select members of Congress and the military establishment are finding themselves and their actions visible and subject to reproach. The question is: are the best interests of the American fighting man being served?

The materiel acquisition process has been an area of considerable Congressional interest for many years. Congress controls the spending of a staggering amount of money each year.

"Annual purchases by DOD total almost \$170 billion more than the combined purchases of General Motors, Exxon, and IBM. The DOD research and development expenditures are more than fifteen times those of France, Germany, or the United Kingdom, and eighty times those of Japan. Defense acquisition involves almost 15 million separate contract actions per year - or an average of 56,000 contract actions every working day." 1/

The efficient and responsible spending of funds is vital to ensure the safety of the nation and the effectiveness of our Armed Services. These funds also have significant secondary implications with respect to defense contracts and employment

opportunities in many of the states. Contractors frequently subcontract parts of large procurement projects to companies located in the state of influential Congressmen. The dangers here are that these interests can potentially influence congressmen to champion specific programs being produced in his or her district or potentially bias the military in their procurement and fielding recommendations.

Fortunately, Congress has, by and large, acted responsibly and the American fighting man has been provided with weapon systems and support equipment that are the finest in the world. However, it is important to note that while these systems are unquestionably the best, they are not perfect. Critics very rarely attack the comparative performance of new developmental versus current systems or other nations' weapon systems. However, finding fault is not difficult. One area that has been particularly lucrative is biased appraisals of the operational test and evaluation of developmental systems. The focus of this study will be on the Army's operational test and evaluation (OT&E) process as opposed to the entire materiel acquisition process (MAP). However, the lessons associated with Congressional involvement in OT&E are just as applicable to the MAP. Further, several of the lessons learned could be applied to many of the other new frontiers that Congress is currently exploring.

DEFINITIONS

The primary purpose for conducting test and evaluation was offered in a 1986 report to the Secretary of Defense:

"...it is essential that the goal of the acquisition process never be lost sight of: providing the users--the young men and women in the field--weapons and equipment that work as the user needs them to and are available when and where they are needed. This will be assured only if decision makers have the benefit of the unfiltered views and findings of an independent OT&E community based upon the best possible 'Will it work?' -oriented test and evaluation of the operational effectiveness and suitability of the system in question, always including realistic field testing of production-representative test articles. These OT&E results must be candidly and responsibly reported, providing the best judgement on whether the system will (or early in the program, is likely to) meet the operational requirements of the user." 2/

A basic understanding of the terminology associated with the MAP and OT&E is imperative in comprehending these areas.

First, one must be sensitive to the fact that we are not just talking solely about the item, the weapon. System or materiel acquisition includes many other critical elements: operator and maintainer training programs, associated support items, detailed manuals, spare parts, tactics and doctrine (which integrates and exploits the full technical capabilities of the new system), and a host of other critical considerations which are absolutely essential to support the effective fielding of a major weapon system. Secondly, there are two major factors that govern the nature of the acquisition process of these complete systems: the acquisition strategy selected and the level of

DOD/DA management exercised. With regard to acquisition strategy, the worst case and typically most costly acquisition is a new development program to produce an entirely new weapon system. (See EXHIBIT 1).

EXHIBIT 1
ACQUISITION PROGRAMS*

THE MATERIEL ACQUISITION PROCESS

TRADITIONAL - A PERIOD OF APPROXIMATELY TWELVE (12) YEARS REQUIRED TO DEVELOP AND ACQUIRE A NEW SYSTEM WHICH INCLUDES THE DESIGN, FABRICATION, AND DEVELOPMENT OF THE ITEM OF EQUIPMENT, TECHNICAL MANUALS, THE TACTICS AND DOCTRINE FOR ITS EMPLOYMENT, TRAINING PROGRAMS FOR OPERATORS AND MAINTAINERS, A COMPREHENSIVE LOGISTIC SUPPORT STRUCTURE, AND A MENIAD OF OTHER REQUIREMENTS NECESSARY TO FULLY SUPPORT THE EFFECTIVE FIELDING OF A MAJOR WEAPON SYSTEM ARMY WIDE THROUGHOUT THE WORLD. THIS PROCESS CONSISTS OF FOUR PHASES: CONCEPT EXPLORATION, DEMONSTRATION AND VALIDATION, FULL SCALE DEVELOPMENT, AND PRODUCTION AND DEPLOYMENT.

STREAMLINED - AN EXPEDITED VERSION OF THE TRADITIONAL PROCESS REQUIRING APPROXIMATELY EIGHT (8) YEARS. THIS PROCESS CONSISTS OF THREE PHASES: PROOF OF PRINCIPLE, DEVELOPMENT AND PRODUCTION PROVE OUT, AND PRODUCTION AND DEPLOYMENT.

CATEGORIES OF NONDEVELOPMENTAL ITEM (NDI) ACQUISITION

CATEGORY A - AN OFF-THE-SHELF ITEM THAT CAN BE PROCURED COMMERCIALY, FROM ANOTHER SERVICE, GOVERNMENT AGENCY, OR A FOREIGN COUNTRY THAT REQUIRES NO ENGINEERING DEVELOPMENT TO MEET THE ARMY'S REQUIREMENTS. MANY OF THE PREFIELDING REQUIREMENTS, SUCH AS DEVELOPING TRAINING PROGRAMS, SPARE PARTS AND MAINTENANCE PLANS, AND OTHERS STILL HAVE TO BE ACCOMPLISHED; THUS, THE TIME REQUIRED FOR ACQUISITION MAY BE TWO (2) YEARS (OR LONGER).

CATEGORY B - AN ITEM THAT DOES REQUIRE SOME RUGGEDIZING AND MILITARIZING PRIOR TO BEING ACCEPTABLE FOR ARMY USE. THESE PROGRAMS REQUIRE SOME ENGINEERING DEVELOPMENT AND VERIFICATION TESTING AND MAY REQUIRE THREE AND A HALF TO FOUR (4) YEARS FOR ACQUISITION.

CATEGORY C - AN ITEM THAT CONSISTS OF SEVERAL CURRENTLY FIELDIED AND/OR COMMERCIALY AVAILABLE ITEMS WHICH HAVE BEEN INTEGRATED AND THAT ONLY REQUIRES A LIMITED AMOUNT OF DEVELOPMENT BEFORE IT IS ACCEPTABLE FOR ARMY USE. INTEGRATION TIME, ENGINEERING DEVELOPMENT, TECHNICAL AND OPERATIONAL TESTING, AND OTHER PREFIELDING REQUIREMENTS MAY RESULT IN THESE PROGRAMS BEING COMPLETED IN FIVE (5) YEARS.

PRODUCT IMPROVEMENT

PRODUCT IMPROVEMENT PROGRAM (PIP) - IS A REFERBISHMENT OF AN EXISTING ITEM OF ARMY EQUIPMENT TO EXTEND ITS USEFUL LIFE, PRECLUDE THE NEED FOR A NEW, COSTLY REPLACEMENT ACQUISITION PROGRAM, AND TO IMPROVE THE EXISTING CAPABILITIES OF THE SYSTEM.

PREPLANNED PRODUCT IMPROVEMENT (P3I) - IS A PREPROGRAMMED SCHEDULE OF IMPROVEMENTS TO A SYSTEM TO EXPLOIT EMERGING TECHNOLOGIES AND TO REDUCE THE TIME AND RISK ASSOCIATED WITH FIELDING THE INITIAL SYSTEM.

* ACQUISITION TIMES INDICATED ABOVE ARE ESTIMATES ONLY. THE TIME REQUIRED FOR THE DEVELOPMENT AND ACQUISITION OF EACH INDIVIDUAL SYSTEM VARIES.

Another case is the off-the-shelf or Non-developmental Item (NDI) which involves the procurement and adoption of an item available in the private sector for military use (there are three categories of NDI programs). The third program type is a materiel or product improvement of an existing military system. This last approach is a preferred strategy or program since it is typically the least costly (at least over the short term), requires less time than full development, and has less technical risk associated with it. (See EXHIBIT 2)

EXHIBIT 2

ORDER OF PRECEDENCE — ACQUISITION STRATEGY



NOTE: PRE-PLANNED PRODUCT IMPROVEMENT (P3I) IS USED IN CONJUNCTION WITH THESE APPROACHES FOR MAXIMUM BENEFIT AT LEAST COST, TIME, AND RISK

Reference: AR 70-1

The documentation, test, and funding requirements are highly dependent upon how an acquisition program is labeled. Variations, permutations, and clever labeling and irrational accommodations of these different types of acquisition programs are not uncommon. There are five system acquisition categories: DOD major, Army designated major programs (DAP), and In-Process Review (IPR) systems Categories 1 through 3. (See EXHIBIT 3).

EXHIBIT 3

Army material acquisition program categories and decision authorities

Program type and category	Program management	Milestone review forum	Program decision authority
MDAP			
DAB level	PEO/PM	DAB	SECDEF (DAE Agent)
Component (Army) level	PEO/PM	ASARC	SECARMY (AAE Agent)
ADAP	PEO/PM	ASARC	AAE
Nonmajor level I	PEO/PM	IPR	PEO
Nonmajor level II	Project officers or equivalent (designated by MATDEV)	IPR	MATDEV Commander
Nonmajor level III	Systems manager, commodity manager, or equivalent (assigned by MATDEV/RDE center)	IPR	MATDEV Commander

Note:

All levels are governed by the principles of AR 70-1; however, the MATDEV may tailor the disciplined management review forums for levels II and III providing that full accountability for systems is maintained.

DOD major and DAF systems characteristically require extensive engineering development and testing. There are several of these systems which are of general Congressional interest because of their high cost and importance. IPR systems typically require less engineering development and testing effort and are occasionally subject to selective Congressional interests. Lastly, there are three types of testing that are part of the MAP. Force Development Testing (FDT) is conducted to assist in refining training programs and in the development of tactics and doctrine for new systems. Technical testing (TT) is a developmental or confirmatory process whereby the item or a subcomponent is tested in a controlled environment to ascertain or to verify whether the current design meets or exceeds system performance requirements. Operational testing (OT) is a confirmatory process whereby the system (to include the soldier, associated support items of equipment (ASIDE), the training program, selected levels of maintenance, and as much of the total system as possible) is tested in an operational (simulated wartime) environment to verify whether the final production system is or has the potential to be operationally effective and suitable for Army use. DODI 5000.2 attempts to highlight just some of the elements of this operational responsibility in defining:

"...Operational Effectiveness. The overall degree of mission accomplishment of a system when used by representative personnel in the environment planned or expected for operational employment of the system considering organization, doctrine, tactics, survivability, vulnerability, and threat (including countermeasures, nuclear, and chemical and/or biological threats)..."

...Operational Suitability. The degree to which a system can be placed satisfactorily in field use with consideration given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistics supportability, documentation, and training requirements." 3/

The key difference between TT and OT is that technical testing is typically an iterative process of controlled "test-fix-test" where operational testing is a confirmatory test of the entire system conducted in an operational environment to determine overall system suitability for Army use. FDT are not always conducted; however, more interest has been placed on trying to conduct these valuable tests prior to the start of OT. It has been very difficult conducting OT's without well thought out tactics and doctrine. Combat developer approved tactics, which exploit new system capabilities, have been particularly difficult to acquire prior to start of OT.

CHAPTER II

OPERATIONAL TEST AND EVALUATION

ORIGINS

Army test and evaluation probably had its origins when some of the first pieces of equipment were being considered for purchase by the government for military use. An early example

is in 1820 when John Hall offered prototype breach-loading rifles to the Army for test. The weapons were tested and deemed unsatisfactory for use in combat and were not procured. The inability of the Army to efficiently develop, test, and acquire sufficient quantities (i.e., standard issue was key to resupply) of the best weapon systems had dire consequences. During the Civil War soldiers fought with substandard weapons, to include obsolete muzzle-loaded muskets. In 1919 the Army tested motor trucks to replace the field wagon.

"The quartermaster department at that time began a developmental and testing program to produce a suitable truck. A test of two Army trucks and a privately-owned truck which was run from Washington, DC to Ft Benjamin Harrison covered 1,524 miles in forty-eight days. The conclusion was reached that although the results were not entirely satisfactory, trucks did show some promise." 4/

Other tests included those of Col. Billy Mitchell who in 1921 demonstrated the effectiveness of Army air against shipping. In 1924 the concept of conducting separate engineering and "service" (operational) tests was formalized in AR 850-25, Types of Equipment Used by the U.S. Army. However, War Department (DOD), industry, and Congressional cooperation in materiel acquisition did not evolve appreciably until WW II. Along with the urgencies involved in America's requirement to mobilize quickly, we became sensitized to the importance of timely production and technological advantages. Early in the war, German Tiger Tanks were so superior that American weapon systems were unable to stop them.

The relationship between industry, Congress, and DOD reached its height during WW II when the nation's industrial base was thoroughly committed to mobilization and technological development. DOD and industry worked in partnership to produce "the best and the most" in support of the American fighting man and the alliance. Since this last declared war, the relationship between industry, DOD, and Congress has suffered and become more adversarial. Today, weapons are far more complex, costly, and efficient. The numbers of items procured has become limited, competition has become stiffer, and design risks have become far greater. Collectively all these factors have created an environment which is more structured, strict, and accountable. During the 50's and 60's, especially with the paranoia associated with the launch of Sputnik in 1958, a considerable amount of emphasis was placed on developing and acquiring high technology weapon systems. Also, much emphasis was placed on engineering testing, and to a lesser degree "service" testing. In the late 60's, in part due to poor performance noted in several of our weapon systems in Vietnam, the services became concerned over undue emphasis on engineering testing as opposed to "service" (operational) testing.

"The war in Vietnam raised numerous questions regarding DT&E.... In February 1970, the Air Force Scientific Advisory Board published a report regarding the differences between operational test results and the results of actual in-the-field, hands-on experience. The Scientific Advisory Board concluded that 'false confidence was held in certain test results which was due to insufficient data accumulated during Category I and II test programs'--testing conducted by the contractor and developer, with little input from the user." 5/

On 1 July 1970 "The Report to the President and the Secretary of Defense on the Department of Defense" by the Blue Ribbon Defense Panel stated:

"4. The quality of OT&E is very uneven. There is no question that military OT&E can and should be planned and executed much more effectively than it has in recent years.

5. The results of OT&E which has been accomplished have not been adequately made available or used by DOD agencies which need them. There is no method of evaluating and preserving such information

6. OT&E is not adequately managed or supervised at the OSD level." 6/

In 1971 Deputy Secretary of Defense David Packard directed the service Chiefs to establish independent operational test and evaluation organizations. As a result each service created an OT&E organization in the early 70's. (Congress did not legislate the creation of a DOD level OT&E office until 1983.) Department of the Army formed U.S. Army Operational Test and Evaluation Agency (OTEA) at Ft. Belvoir, Va. on 25 September 1972 (Today located at The Park Center II Building in Alexandria, Va.). The original mission of OTEA was:

"...Accomplish the planning for, direction of, and evaluation of operational testing of all major systems and selected non-major systems required in the materiel acquisition process.

...Coordinate Force Development Testing and Experimentation.

...Coordinate Army participation in the planning and conduct of joint and combined operational test activities.

...Provide a strong focal point organization at Headquarters DA to keep DA and OSD fully informed on the Army's operational test and evaluation needs and accomplishments." 7/

The other services also complied, the Navy with Operational

Test and Evaluation Force (OPTEVFOR), the Air Force Operational Test and Evaluation Command (AFOTEC), and the Marine Corps Operational Test and Evaluation Agency (MCOTEA).

ARMY OT&E

OTEA is a field operating agency of the Office, Chief of Staff, Army (OCSA). Its current mission is to support the MAP by managing the Army's continuous, comprehensive evaluation (C2E) and user test programs. The original organizational concept for OTEA was well thought out, effective, and efficient. It would have even made former Secretary of Defense, Robert S. McNamara, proud. Two of the primary considerations in forming OTEA were independence of (1) operational testing and (2) independence of operational evaluation. A key conclusion of the 1970 Blue Ribbon Defense Panel was that "...it was not in the interest of unbiased and objective operational test and evaluation to have those who perform it report through the developer..." One of the perceived, critical deficiencies of previous test and evaluation processes was the lack of independence. Even though problems were discovered, lack of independence, at times, resulted in rationalization which minimized the importance of test findings. This significantly impaired a process which should have otherwise communicated these problems to the highest level of decision making. As a result OTEA is

commanded by a Major General who works directly for the Chief of Staff, Army (CSA) and OTEA has a Senior Executive Service (SES) Scientific Advisor (or Technical Director) who maintains a close working relationship with the Army Secretariat. This balanced relationship between the OTEA commander-and-the CSA and the OTEA Scientific Advisor-and-the DOD/Army Secretariat has been a major factor in contributing to the success and independence of the Army's OT&E efforts.

OTEA is a very small organization composed of less than 250 professional people, approximately half of them are military and half are civilian. OTEA is charged with the responsibility for the programming, design, conduct and evaluation of operational testing of major (and selected non-major) Army materiel acquisitions. Also, C2E responsibility for IPR Category (level) 2 and, to some extent, Category (level) 3 systems is a newly assumed mission. OTEA's required level of effort in order to perform this new mission has been difficult to estimate. Performing this new mission will entail a considerable, total acquisition process evaluation responsibility for several hundred weapon systems or combat support and combat service support equipment. The exact number of these programs has been very difficult to determine since individual programs are managed with varying levels of intensity by TRADOC schools, Health Services Command, Informations Systems Command and others. The Army leadership's focus is only on several of the higher priority programs.

There is no central management of these several hundred lesser Army materiel acquisition programs; even though, it has been argued that, collectively these lesser systems may represent a considerable portion of the defense budget. OTEA is in the early stages of compiling an accurate list of active materiel acquisition programs; funding/cost information on all these programs is not available.

OTEA's preoccupation with strengthening and expanding the scope of its evaluation mission has had some negative effects. OTEA's independent operational testing mission has significantly diminished to a point where the agency will conduct or closely manage only one or two operational tests per year. Originally, OTEA was charged with performing both (1) the independent operational testing and (2) the independent operational evaluation mission for Army major and selected non-major weapon systems. Today, OTEA has significantly expanded the scope of its independent evaluation mission (C2E) to include total life cycle evaluation of many more systems and has delegated nearly all of its independent operational testing mission to Training and Doctrine Command's (TRADOC) test boards. TRADOC is typically the combat developer for the system being tested. The merits of these actions are many; however, the chief advantage is that the test boards are better suited for the testing of complex weapon systems. Many of these systems require the use of sophisticated instrumentation and facilities to produce accurate, meaningful test results.

Further, OTEA's evaluation mission has profited from having its evaluators being privy and a party to the whole development process. Evaluators participate in both technical and operational planning efforts as a member of individual weapon system acquisition teams. This has significantly increased the evaluator's understanding of the system, its status, and how far it has progressed in development. The con of this approach is that the operational testing process has lost a considerable amount of independence and one might argue that more of the evaluation focus is being placed upon engineering assessment as opposed to operational considerations. True independence will be difficult to attain until both the operational testing and operational evaluation missions for all new weapon systems are consolidated into a separate, Army independent operational test and evaluation command. Authority, leadership, command lines, test facilities, and staffing will be key to the success of such a command. OT&E must be uncompromising and responsibility for its conduct must be kept at the service level. OT&E focus must remain on selecting the best materiel for the soldier, sailor, or aviator. In this age of limited resources, higher level authority must have the benefit of unbiased OT&E results to facilitate the decision making processes which must prioritize and make compromises for the overall good of the service or DOD.

CHAPTER III

DEFENSE OPERATIONAL TEST AND EVALUATION (DOT&E) OFFICE

Congressional concern regarding the adequacy of DOD management of OT&E goes back to the 1970 Blue Ribbon Defense Panel: "OT&E is not adequately managed or supervised at the OSD level." As a result of increased media and Congressional interest in the MAP, legislation was introduced by Senators David Pryor (Democrat from Arkansas) and Senator William Roth (Republican from Delaware) for the creation of a DOT&E office in April 1983. Congress's rationale for establishing this office, Public Law 98-94, is perhaps best captured in a letter from Congress to Secretary of Defense Carlucci on 9 December 1987. The purpose of this letter was to inform the Secretary of Congressional concern over a significant loss of independence which could result from DOT&E's plans to broaden its mission to include developmental T&E.

"In 1983, the Congress voted overwhelmingly in favor of creating an Independent Director of Operational Testing and Evaluation. We did this to make certain that the office charged with analyzing the vital field tests of our weapons would not in any way be compromised by ties with the weapons development community, including the services and contractors, who created and advocated the weapon systems. Before Congress took action, as Senator Roth stated on the floor of the Senate last year: 'operational testing was controlled by the same man who controlled research, development and acquisition. And we had problems. We had cheating in tests; we had rigged tests; sometimes we had no tests; and often we had self-serving test analysis and reports influenced heavily by those who did not want to see their own handiwork objectively assessed.'" 8/

DOT&E was established in Nov 1983 under the temporary leadership of Dr. Isham W. Linder, Director of Defense Test and Evaluation. Another layer of review was imposed upon an already review laden MAP.

DOT&E enjoys a rather unique position in the MAP in that it approves system Test and Evaluation Master Plans (TEMP's) and the test design plans (TDP's) for OT&E of all systems it identifies for oversight. DOT&E's emphasis is primarily on DOD major systems; however, it does monitor select ADAP and IPR programs. It must approve these plans in writing prior to initiation of operational testing and by law DOT&E has funding release authority for the conduct of these tests. DOT&E conducts independent evaluations of these test results which it reports directly to the Secretary of Defense and Congress.

Even though the presence of DOT&E has been a positive influence in improving the overall quality of the MAP, it is an additional impediment to the timely execution of individual service materiel acquisition processes. The chief criticisms of DOT&E include its heavy reliance on contractor support, failure of its staff to visit test sites for sufficiently long periods of time to assess system performance, and its parochialism and strong bias. The office is perceived to have a preoccupation with and devotes much of its efforts to personalized threat assessment and sometimes to questionably required expensive baseline comparison testing. DOT&E has

recently completed a contracting effort for the development of an in-house threat assessment data base.

However, DOT&E's authority is substantial and it has had a significant and positive influence on the MAP. Mr. John E. Krings, Director of DOT&E, soon after he assumed his position as director stated in a memorandum to military departments, defense agencies, and the National Security Agency:

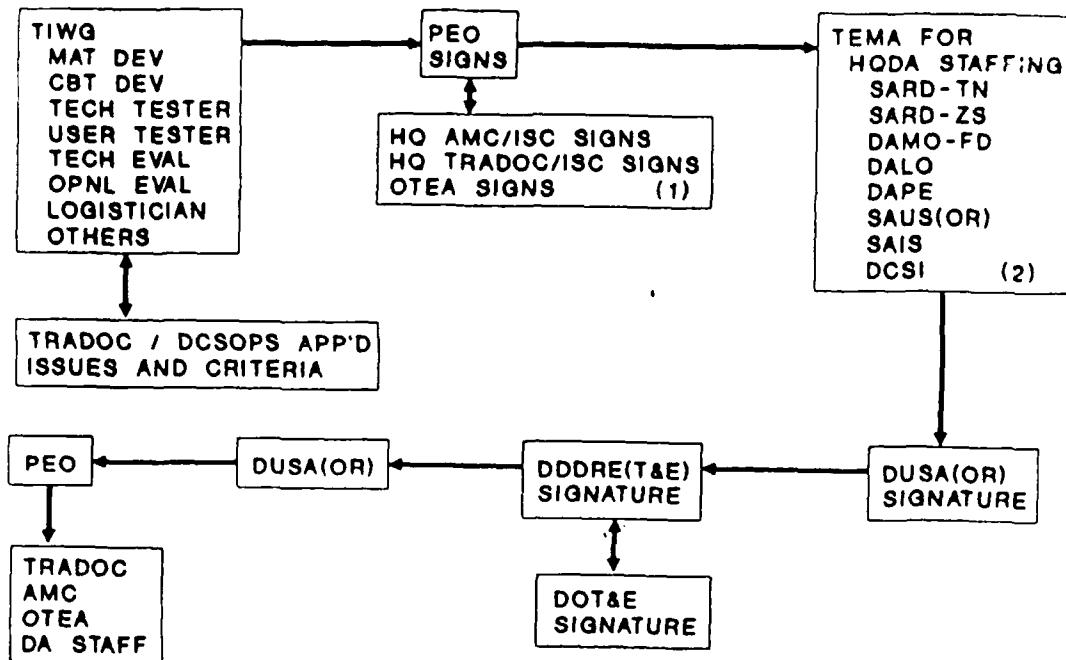
"Title 10, United States Code assigns overall responsibility for operational test and evaluation (OT&E) oversight in the Department of Defense to the Director, Operational Test and Evaluation (DOT&E). As amplified by DoD Directive 5141.2, the Director is required to maintain oversight of the major DoD programs which meet the criteria of Section 2432 (formerly Section 139a) of Title 10, together with any other programs he may choose to designate....

Programs under DOT&E oversight are subject to the provisions of DoD Directive 5000.3, 'Test and Evaluation.' In particular, for each listed program a (Test and Evaluation Master Plan) TEMP must be submitted to OSD for approval, with annual updates to ensure currency, unless the program has progressed past the point where appreciable future testing is planned." 9/

The new requirement for a DOD level review brought more focus to the role of good test planning as part of a viable acquisition strategy. From a negative perspective, this emphasis has drawn the Senior Army Staff into the review and approval of TEMP's. Working documents have thus become staff products. The process for staffing this document was recently released by the Deputy Under Secretary of the Army for Operations Research office. (See EXHIBIT 4).

EXHIBIT 4

TEMP Staffing Process 22 December 1988



- (1) PEO LEAD - 30 DAYS OR LESS
(2) TEMA LEAD - 16 DAYS OR LESS

Frequent criticism of the length of the MAP is answered in part by the staffing requirements as outlined above. The staffing process in the Pentagon is very difficult; it requires tracking down people who are on travel, briefing and trying to quickly educate people who have not been involved with the program, and constantly correcting and retracing steps to ensure that

previous reviewers agree with the newest set of corrections. The amount of time and effort required to staff and obtain approval of a TEMP, TDP or the review of an Independent Evaluation Report (IER) typically far exceeds the time required to conduct the test. We have gone to great pains to streamline the acquisition process, the staffing process has yet to be similarly influenced. Often, staffing requirements become so overbearing that over time they are either ignored or are replaced by a requirement to obtain approval from a review/decision making board.

Another aspect of this increased oversight is explained by LT GEN George H. Sylvester (USAF, ret.) in his report to the Packard Commission, "The Role of Test and Evaluation in Defense Acquisition" (December 1985):

" ...Unfortunately, the growth of microscopic scrutiny and micromanagement from above, particularly from the Congress and OSD, have given rise to Service defensiveness that makes it more and more difficult to surface and come to grips in a timely fashion with problems unearthed by testing.... Under the prevailing culture, most major programs begin to acquire a constituency of their own soon after they enter the development cycle. In due course they take on a strong Service identity, nurtured on the one hand by contractor advertising, trade conventions, roll-out ceremonies and the like and on the other by budget planning, force structure planning, IOC dates, etc. Eventually the program reaches the status that it must not, indeed cannot, fail. The program manager is the Service agent responsible for guiding the system through the acquisition cycle and all of his incentives are in the direction of successfully deploying the system on schedule. In such an environment, the independent OT&E agency (OTEA in the Army, OPTEVFOR in the Navy, and AFOTEC in the Air Force) faces a tough task, particularly if it is to be the purveyor of bad news that their service's

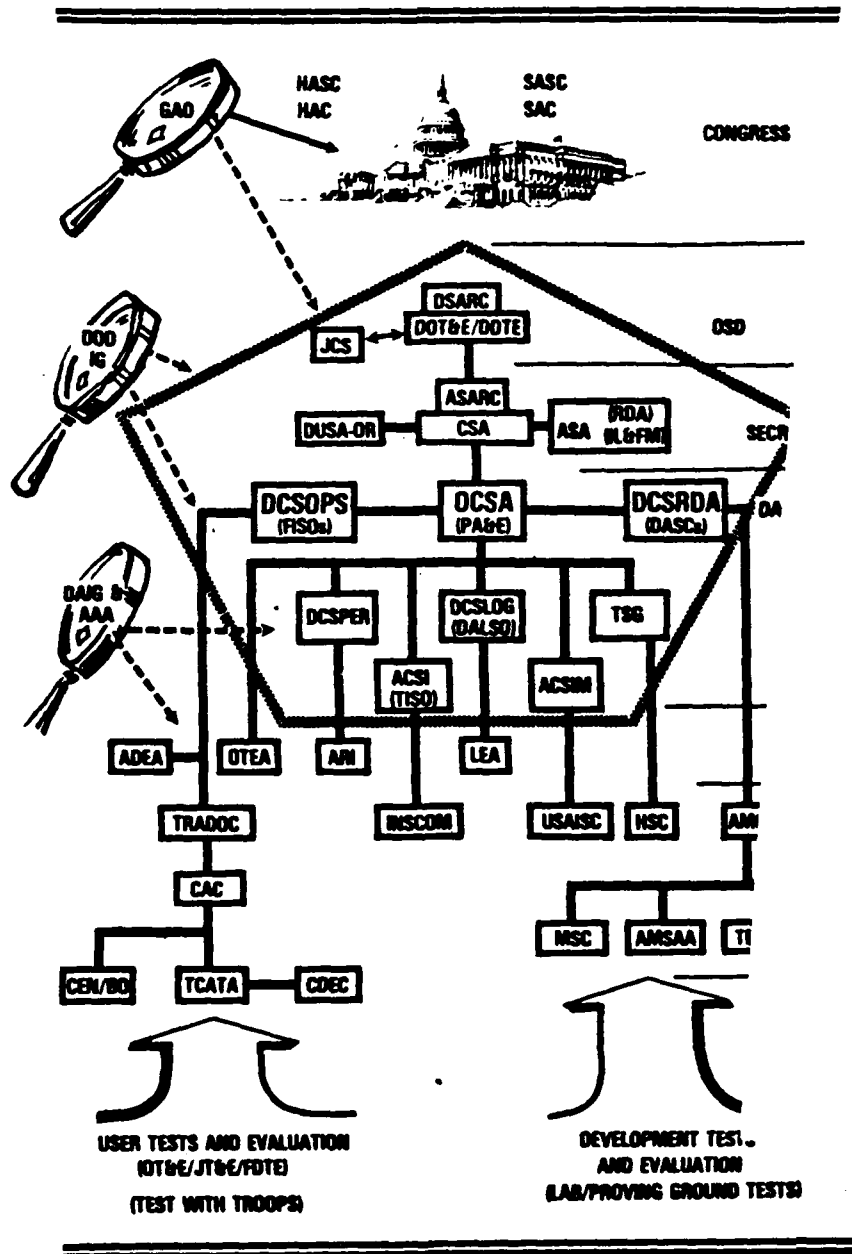
new 'Golden Albatross' has serious operational shortcomings. Even the using command, which would stand to lose the most from a new system that performed below expectations, will more readily support the system as is than risk the prospect of program delay or perhaps even cancellation by raising serious objections. After all, it is a rare system that even with its shortcomings is not a significant improvement over the system it replaces....

...As a result of the powers bestowed upon (the DOT&E) by the Congress (and) the standards of independence which the DOT&E is exercising...there (is) a growing recognition within the services, including the very senior levels, that an open, honest, and non-adversarial dialogue (needs) to be established and maintained on each Defense acquisition program from the very beginning." 10/

This new openness is very important and DOT&E is but one contributor. Even with the recent DOD reorganization, oversight activities are still in place: GAO, DOD IG, DA IG, and the AAA. (See EXHIBIT 5). The OT&E process still requires some refinement to enhance independence and also to minimize redundancy. The Secretary of Defense's role in the MAP and T&E could be strengthened. Overlapping OT&E Congressional oversight missions of the Government Auditing Office with its staff of 5000+ in offices located throughout the country and DOT&E with its pitifully small staff located at the pentagon should be more equitably balanced.

EXHIBIT 5

T&E OPERATIONAL RELATIONSHIP



CHAPTER IV

SURVIVABILITY/VULNERABILITY LEGISLATION-

"WHISTLE-BLOWERS".

Occasionally the headlines are filled with the latest results of "investigative reporting", scandal as related by a disgruntled former employee. The "whistle-blowers" are entitled to bounties as high as 25% of the damages awarded which are offered under the False Claims Act. The court dockets are growing with cases of this type. There is a potential for these Congressionally mandated awards to become subversive. The overall results are counterproductive to the MAP. One might argue that the savings realized by the government more than warrant the costs of rewarding the source. However, even individuals working faithfully within the government and trying to make it better, are entitled to far less. If they are lucky, this award amounts to 10 percent to as little as half a percent of the amount saved by the government. Care must be exercised to protect against excessive policing and micro management. Ethics, "public trust", and responsible actions are very important and should be held in high regard. Punishment for indiscretions, violations, or criminal actions should be quick, severe, and proportional. However, cooperation is the key to success of any organization and external police efforts tend to foster adversarial relationships which are counterproductive.

Self-policing as part of a Total Quality Management (TQM) program is far more preferential.

One of the most notable "whistle blowers" is Col Burton, USAF. Col Burton's criticism was that new weapon systems were vulnerable to live fire. The implication was that the services were not subjecting new weapon systems to actual live fire during the test and evaluation process. This was not entirely true. The basis for all operational testing is typically categorized into thirteen areas:

- Performance
- Reliability, availability, maintainability
- Durability
- Logistics
- Survivability/vulnerability
- Mobility
- Interoperability
- MANPRINT:
 - Human Factors Engineering
 - Training (system and tactics/doctrine)
 - Safety
 - Health Hazards
 - Manpower
 - Personnel

Limited numbers of available prototypes, cost and time constraints typically preclude extensive testing in three of these areas: survivability/vulnerability, interoperability, and logistics. A key element in assessing the effectiveness of a weapon's survivability/vulnerability characteristics is to determine its weaknesses to live fire. Actual live fire testing tends to be destructive. Destructive testing is in fact an infrequent occurrence for obvious reasons. Prototypes are typically very expensive, few in number, and are of little

value after destructive testing. Frequently the answers with regard to systems survivability and vulnerability can be estimated more efficiently by other methods. Estimation of weapon system survivability and vulnerability characteristics are evaluated as a function of many factors, such as: where the round hits, the angle at which it hits, the type of round, the range at which the target is hit, to name but a few. An infinite number of combination and permutations make computer modeling a much better method of estimating system survivability/vulnerability characteristics than live fire testing.

However, if the intent of Congress was to place more emphasis and attention on this important area of assessment, they have accomplished their end. In a letter to the Secretaries of the Military Departments (dated 25 November 1986) Mr. Godwin, the Defense Acquisition Executive (DAE), offers a reasonable and logical interpretation of this new survivability/vulnerability legislation:

"The spirit of this new legislation requiring Live Fire Testing is to cause weapons designers and proponents to assess the survivability and lethality of their systems sufficiently early in the development process to permit effective and efficient fixes in a timely manner. The overall objectives of Live Fire Testing are:

- Estimation of vulnerability of combat-configured system to threat munitions,
- Estimation of lethality of munitions against their principle foreign targets, and
- Provision of early insights into design changes or modifications necessary to reduce vulnerabilities and/or improve lethality." 11/

Both the U.S. Army Ballistic Research Laboratory (BRL) and U.S. Army Materiel Systems Analysis Agency (AMSAA) are involved in the assessment and evaluation of the survivability/vulnerability performance characteristic of new weapon systems. Test and Evaluation Command (TECOM) frequently conducts limited live fire testing. The data from these tests are used to supplement extensive computer modeling and simulation studies of live fire effects. Results from these lethality models are then used to evaluate the effectiveness of weapon system design. A potential weakness here is that both BRL and AMSAA should play a more active role earlier in the MAP and assist (1) program managers in drafting realistic survivability/vulnerability specifications and (2) contractors in the development of optimum survivability/vulnerability design. Department of Defense has devoted an extensive amount of money and resources to the study of live fire effects. In March 1984 the Office of the Director, Defense Test and Evaluation Office chartered the Joint Live Fire Program (JLF). This program has been very successful.

"Over the last three years, these JLF efforts have yielded numerous insights into the way our combat systems would actually respond in combat situations. Testing continues under this program at Wright Patterson AFB, Naval Weapons Center (China Lake), Edwards AFB, Aberdeen Proving Ground, Socorro NM, and other test facilities. U.S. and foreign munitions and weapons platforms (tanks, armored personnel carriers, fixed and rotary wing aircraft, antitank guided munitions, shoulder launched shaped charge munitions, mines, kinetic energy penetrators as well as a host of other systems) have been, and continue to be, tested within the JLF under DOD sponsorship, examining systems that have already arrived on the battlefield in significant numbers." 12/

The question that remains is should live fire testing be more extensive?

In response to Col Burton's revelations, Congress mandated the answer to this question. Instead of assessing the merits of this testing on a case by case basis, the FY87 Military Authorization Act requires the following for all major weapon systems:

"(a) REQUIREMENTS.--(1) The Secretary of Defense shall provide that--

(A) a covered system may not proceed beyond low-rate initial production until realistic survivability testing of the system is completed....;

(B) a major munition program or a missile program may not proceed beyond low-rate initial production until realistic lethality testing of the program is complete....; and

(C) a major defense acquisition program may not proceed beyond low-rate initial production until initial operational test and evaluation of the program is completed....

(b) GUIDELINES.--(1) Survivability and lethality tests required under subsection (a) shall be carried out sufficiently early in the developmental phase of the system or program (including a covered product improvement program to allow any design deficiency demonstrated by the testing to be corrected in the design of the system, munition, or missile (or in the product modification or upgrade to the system, munition, or missile) before proceeding beyond low-rate initial production."

13/

The problem here again is that "sufficiently early" is too late. AMSAA and BRL need to become part of the survivability/vulnerability design efforts during the pre-prototyping design phase.

Further, in a time where resources are severely limited, testing is not always cost effective nor warranted. "Testing-for-testing-sake" is irresponsible when results can be obtained from other sources. There are systems which are "soft targets", trade-offs have been openly made for the sake of other higher priority performance characteristics, such as mobility, combat weight restrictions, MANPRINT, and others. A completely invulnerable weapon system has yet to be built, legislative micro-management dictating wholesale survivability/vulnerability testing is in error here. A Congressional vehicle for assuring adequate survivability/vulnerability test and evaluation is already in place. The Defense Operational Testing and Evaluation (DOT&E) Office is charged to ensure that operational testing is adequate and to provide status reports to Congress. Why legislate or rather dictate live fire testing across the board when it may not always be appropriate. DOT&E can service this Congressional management concern much more effectively and with far less criticism. Further a key factor in adequate live fire testing is identifying the proper threat. DOT&E maintains a current threat database and is in an excellent position to ensure that baseline threat questions are assessed and answered.

CHAPTER V

CONTRACTOR PARTICIPATION LEGISLATION- GOVERNMENT AUDIT ORGANIZATION.

Operational testers have always been very sensitive to contractor influence or even perceptions of contractor influence on operational testing. As a matter of policy contractors have been allowed to observe pilot testing, but once operational testing has begun, are precluded from participating in record testing. Record testing is individual system test time when realistic operational data is being recorded for use to support the operational evaluator's analysis and report. This subtle qualification is necessary because contractors frequently do play a legitimate role in operational test administration by representing higher levels of maintenance (i.e., direct support, general support, depot, and contractor). This support is provided as follows: The contractor trains a government training team on the system. The government training team trains military to be system operators and unit/organization level maintainers. When a system has a maintenance problem during testing, military maintainers attempt to correct the problem. The adequacy of their training, manuals, and test equipment are evaluated. If the military maintainers fail to correct the problem and all other maintenance alternatives are exhausted, contractor maintenance is requested. Contractor activities are closely

monitored; all parts used, maintenance times, and other data are fully documented. When the problem(s) has been corrected, the contractor leaves the test area and the test item resumes record testing. One might rationalize this limited role of the contractor by (1) there are always unforeseen maintenance problems or design flaws that fall outside the scope of preliminary maintenance training plans. Without limited, controlled contractor maintenance support, testing would quickly come to a halt precluding collection of further performance and maintenance data. (2) Current system maintenance concepts call for built-in-test and diagnostic equipment (BITE) and modular replacement at the unit/organization levels of maintenance. Rather than trying to repair defective parts in the field, they are evacuated to higher levels of maintenance. Many of these higher level maintenance activities have been centralized and civilianized. And (3) currently many major systems have maintenance concepts which call for contractor maintenance support of the fielded system. There are two other roles that contractors have played in operational testing but these are less frequent: providing technical clarification to the RAM Scoring Conference membership and providing complex data collection instrumentation and automation and data verification support.

As part of the T&E process, meetings are held during and just after both developmental and operational tests to review reliability, availability and maintainability (RAM)

data, RAM Scoring Conferences. Data is collected during tests to record all the activities and actions associated with system maintenance problems. This data includes the time that it takes to correct the problem, the manhours of maintenance time required at each level of maintenance, the impact of the problem/failure on the ability of the system to perform its mission, and a wealth of other valuable data. A scoring conference committee reviews each RAM incident to determine the probable cause (i.e., hardware, software, crew, training, etc.) and type of failure (i.e., operational mission failure, system failure, etc.). The basis for this chargeability/classification process is a formal set of rules documented in the approved Failure Definition/Scoring Criteria for the system. At the end of each test these scoring conferences are followed by a final RAM Assessment Conference. RAM incidents are reviewed in terms of grouping multiple failures or related failures, types and severity of failures, training problems, assessing proposed corrective actions or the effectiveness of previously applied corrective actions. The purpose of this complex process is to thoroughly assess RAM data and to develop a common RAM data base to support the RAM characteristic evaluation of a system by all parties concerned.

As valuable and rational as this process seems, one of its major weaknesses is the limited expertise of the membership of these RAM conferences. As weapon systems become more

complex and civil service professional engineering salaries become increasingly less competitive, hiring and retaining qualified engineering personnel becomes increasingly more difficult. Therefore, contractor participation in RAM scoring and assessment conferences is frequently required to address questions regarding probable causes of failures and related complex weapon system design questions. Unfortunately, in the interest of obtaining a comprehensive understanding of the RAM characteristics of the weapon system, there is a significant potential for undue contractor influence on the RAM scoring process. The seriousness of this RAM scoring problem was cited by the GAO. The potential for contractors to unfairly bias independent test results was deemed unacceptable and placed the credibility of operational testing in jeopardy.

Contractors may play other roles in OT. On occasion, contractors develop complex diagnostic equipment to assist them in the development of very complex systems. This equipment can provide valuable insights into the probable cause of system failures that occur during OT and can greatly assist in resolving data collection anomalies. Frequently this instrumentation is the only reliable source of data which can be used to at least partially evaluate critical elements and subelements of performance. Without access to this data source, evaluators would be forced to severely limit their assessments and to present their findings as test limitations (i.e., data not available to answer the questions). The

complexities of this instrumentation and associated automated data reduction requirements frequently require the use of contractor technical personnel, ADF support equipment, and facilities. Also, use of this instrumentation can greatly assist the contractor in the isolation of the cause(s) of failures observed during testing and more efficiently redesign the system to correct these problems and to produce a system that meets the Army's needs. Strict prohibition of contractor involvement in operational testing would preclude the evaluator from more fully assessing system performance.

In response, Congress included the following in the FY87 Military Authorization Act:

" (2) In the case of a major defense acquisition program, no person employed by the contractor for the system being tested may be involved in the conduct of the operational test and evaluation required under subsection (a). The limitation in the preceding sentence does not apply to the extent that the Secretary of Defense plans for persons employed by that contractor to be involved in the operation, maintenance, and support of the system being tested when the system is deployed in combat." 14/

The intent of Congress in passing this legislation was the subject of considerable debate among the service OT&E groups, and services' interpretation of the law vary widely. Currently, there is no formal, joint coordination mechanism between the services judge advocates for the interpretation of public law.

Even though Congress's motives in passing this law were based upon several isolated incidents, an interpretation of the law would indicate that Congress was taking broad action without considering the costs and consequences. The Army, which tends to be more literal in its interpretation of legislation than the other services, proved to be right in this case. Mr. B. Goldwater, Chairman of the Senate Committee on Armed Services, in a 5 Jan 87 letter to Mr. C. Weinberger, Secretary of Defense, provided the following:

" ...It is our intention to ensure that, during operational tests, weapon systems are operated, maintained, and otherwise supported by personnel typical of those who carry out such duties when the system is deployed in combat. It is our further intention that the processing and evaluation of test data be carried out in a completely objective manner with no possibility or even the appearance of system-contractor manipulation.

Therefore, under the limitation established by PL 99-661, system-contractor personnel may be involved in an operational test only to the extent that is planned for them to be involved in the operation, maintenance, and other support of the system being tested when that system is deployed in combat. We would expect that very few, if any, conventional combat systems as defined in PL 99-661 will entail such post-development contractor involvement. Thus, few, if any, operational tests will entail any sort of system-contractor participation." 15/

An attempt by Mr. Krings, director of DOT&E, to convince Congress to allow the services more latitude in controlling contractor involvement in operational testing met with resistance. In a 31 May 1988 article in "Defense Week" Mr. Joseph Cirincione, the Congressional committee staff member who drafted the legislation stated:

"There's a real good reason why you don't want contractors involved in the tests,... The systems should be tested like they will be fielded in combat without contractor support...

It seems silly to try to change the law again,...Congress has tried to get tough on operational testing while Krings' office has tried to make it more bureaucratically efficient." 16/

Contrary to popular belief, several major weapon systems have wartime contractor maintenance support concepts. However, the problems associated with eliminating all contractor support from testing are far greater. A case in point, competitive testing as part of source selection processes is a common occurrence. The time, cost and negative training impacts of training soldiers to perform all levels of maintenance for all competing systems is ludicrous. High level maintenance training typically requires months of classroom and hands-on system time. Further, the frequent occurrence of unanticipated system failures, the maintenance for which may have not been included in the preliminary training package, would result in costly and unwarranted termination of nearly every operational test conducted. However, contractor participation in the RAM process is perhaps unwarranted; the merits of other limited contractor participation in the conduct of operational testing should be assessed on a case by case basis and should be strictly controlled.

CHAPTER VI

CONCLUSIONS

Department of the Army's Materiel Acquisition Process has been refined over a period of many years. The Army's commitment to the continued improvement of the MAP in order to better facilitate the acquisition of the weapon system, to include all associated support documentation, training, facilities, and equipment is long standing. The inherent complexities of developing and fielding a complete weapon system package are often overlooked when critics rate the effectiveness of the MAP. The Army's MAP is a comprehensive, efficient, and effective process when materiel developers adhered to it. However, no matter how good the process is, without effective and dynamic management, weapon system materiel acquisition efforts will have far less chance of success. Significant improvements can still be made in the MAP. A major consideration among actions which would make this possible is that we need to put the "T" back into OT&E. More emphasis needs to be placed on the quality and independence of operational testing as well as operational evaluation. Further, DOT&E needs to shed itself of much of its contractor support, assume more comprehensive OT&E responsibility, and increase its personnel strength. If Congress is serious about having a credible DOT&E office, this office should be held accountable for ensuring that survivability/vulnerability testing is adequate and that the level of contractor

participation in operational testing does not adversely impact on the credibility of the testing efforts. To preclude duplication of effort, DOT&E should fully assume the mission and assimilate a significant portion of the GAO assets that are currently dedicated to the review of the MAP for Congress. In summary, isolated management problems are frequently cited as examples of the failure of the MAP. Reorganization, broad policy changes, and more recently legislative actions have typically been offered as the solutions to these problems. These actions while correcting one perceived problem frequently cause other more serious problems. Overall the MAP is a proven and very effective approach; refinement and more attention to total quality management are the real answers to improving this critical process which governs the engineering development and fielding of all Army systems.

CHAPTER VII

RECOMMENDATIONS

* In the interest of circumventing the perception of conflict of interest, members of the House or the Senate Appropriations, Authorization, Budget, and Armed Services Committees should be prohibited from either directly or indirectly receiving campaign contributions, consultant fees and/or honoraria from defense contractors and/or subcontractors.

* Department of the Army (and each service) should establish an operational (1) test and (2) evaluation activity (or two complementary activities) responsible for the conduct of all Army system acquisition OT&E. This organization must be completely independent of the chain of command of the combat developer, the materiel developer, or the program manager. An independent Army OT&E command reporting directly to the CSA would be a major improvement. (Centralization of multi-service OT&E functions at the DOD level is not recommended. This would result in a significant loss of independence and would not serve the fair and, at least initially, uncompromising consideration of many of the service unique requirements of the American fighting man: soldier, sailor, and aviator.)

* Improvement and more stringent internal management of the MAP is warranted. Giving "whistle-blowers" a bounty for identifying problems is wrong and the practice should be terminated.

* AMSAA and BRL should assist the program manager in drafting realistic survivability/vulnerability system specifications and play an active role in assisting contractors in optimizing survivability/vulnerability characteristics particularly during the pre-prototype design phase.

* The scope of survivability/vulnerability "live fire" testing should be limited and used to verify computer simulation estimates of system survivability/vulnerability characteristics. This testing and analysis should be closely managed and should be under the close oversight of DOT&E.

* System contractor/subcontractor participation in operational test RAM Scoring and Assessment Conferences is unwarranted. Limited contractor/subcontractor participation in operational non-record testing activities, such as, providing essential higher level maintenance support, sophisticated test instrumentation, and other technical support are occasionally warranted and should be closely managed by OTEA and monitored by DOT&E.

* The DOT&E organization needs to be reexamined and consideration should be given to maintaining a staff element at the Pentagon with a field operating activity located elsewhere.

* The overlapping MAP oversight and investigative missions of the GAO, DOD IG, DOT&E, DA IG, and AAA need to be examined and resources shifted to support the most effective accomplishment of these important missions.

* Permissible review time allocated for staffing of TEMP's should be strictly controlled. Failure to respond should be assumed concurrence. The amount of required coordination should be strictly limited. The creation of a DOD/DA level TEMP Review and Approval Board (TRAB) would expedite the process even further.

* "Test-for-testing sake" should be closely guarded against. Requirements for expensive baseline system comparison testing should be fully thought out and closely monitored by DOT&E.

* The ability of contractor to provide wartime maintenance support should be reexamined. Current civilian technical support contractual agreements during period of war are tenuous at best.

* DOT&E should oversee the early identification of the baseline threat which will be used as the basis for operational testing and which should be included in the TEMP. DOT&E currently maintain an in-house threat database to assist them in this effort.

* A viable methodology to support the OT&E of system logistics characteristics is critically needed.

* The OT&E of system interoperability characteristics should be refined and expanded. A serious commitment to the funding and establishment of "test beds" will be required to make the necessary improvements in this important test area.

* Program Manager Acquisition Strategy approval processes should be re-examined. Requirements for substantial engineering development are, at times, down played in order to facilitate the pursuit of a Non-Developmental Item (NDI) strategy. If we are going to have a MAP, it should be followed.

* Force Development Testing and the development of an approved TRADOC system specific tactics document (which exploits the full capabilities of the new system) should be an established prerequisites for the start of OT.

* Operational Assessments for major weapon systems should be conducted early in the MAP at the contractor's plant (if necessary) to facilitate the timely correction of problems and the exchange of military expertise. This requirement should be strictly enforced and be a condition for entry into the full scale engineering development/development-production prove out phase of the MAP for major weapon systems.

* A formal system and oversight responsibilities for tracking the correction of system problems discovered during testing need to be established and institutionalized. RAM and MANPRINT T&E represent the greatest sources of these problems.

* Establishment of a comprehensive, centrally managed database containing discrete system and funding information for all systems in the MAP should be a major priority in refining the MAP.

* A joint or multi-service coordination process should be established by the four services' Adjutant Generals to facilitate improved and consistent compliance with new service related Congressional legislation.

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